

# Chapter 5

## Comparing HRM Practices for R&D in Business and University Centres

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**Abstract** Governments are now very aware of the importance of technological development for business and economic growth, and this has led to efforts to stimulate investment by organisations in research and development (R&D). There are two main policy approaches for achieving this: (1) direct procurement and/or provision in public facilities and (2) incentives for private investment such as tax incentives or R&D subsidies. In this chapter, the focus is on the second of these approaches, incentives for R&D, and specifically examining these investments through the lens of human resource management (HRM) practices. A focus on HRM is warranted, given that R&D investment is dominated by capital equipment and knowledge workers with longer-term organisational benefits most commonly achieved through R&D employees as behaviours acquired through the publicly supported R&D are sustained in the post-funding period. However, this raises important issues where government investment is in private sector organisations such as businesses or public sector organisations such as universities. To what extent are there similarities and differences in the profile of R&D employees and HRM practices of business and university R&D centres? What are the implications of this for government efforts to stimulate R&D investment through subsidies?

### 5.1 Public Sector Investment in R&D

In recent years, innovation policy has recognised that the capability of a nation to generate advanced technology, information and ultimately knowledge is the 'single most important force driving the secular process of economic growth' (p. 1 in [1]). In the UK and the USA, public sector innovation budgets have been

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balanced between fiscal incentives for innovation, subsidy measures and 'integrated packages of support [2], while in other countries, e.g. Finland, direct support measures (subsidies and loans) have dominated, while in others, e.g. France, more emphasis has been placed on direct credit and loan support.

Public sector support for research and development (R&D) activity has traditionally been explained in terms of 'market failure' arguments whereby organisations—private or public—unable to capture all of the benefits of their R&D investments tend to under-invest in R&D relative to the social optimum level [3–5]. Alternatively, the rationale for public support of R&D may be based on an evolutionary view of economics and in particular the innovation process. Here, R&D support is justified in terms of developing the portfolio of export products, contributing to cluster development or enhancing the competitiveness of local supply chains. In each case, however, investment in R&D or technological capability is perceived as being strongly associated with productivity and economic growth [6–8].

This positive relationship between R&D investment and productivity growth is evident at the macro-economic level [9], as well as regional levels [10]. Further, sectoral studies have also emphasised the positive relationship between R&D intensity and innovation outputs across a range of high-tech [11] and low-tech sectors [12]. In addition, at the firm or business unit level, evidence of the positive innovation effect of firms' internal knowledge investments is also widespread. Artz et al. [13], for example explore the relationship between R&D investment and patenting and R&D investment and product announcements by large North American firms finding a positive relationship in each case.

The extent to which public sector financial support for R&D investments results in private performance gains as well as wider social benefit depends on a number of factors [14]. Perhaps one of the most important is human resource management (HRM) practices. Systematic research has demonstrated the relationship between HRM and organisational performance [15–17], highlighting that an organisation's human capital represents its collective capacity to extract optimal solutions from the knowledge of its employees. Investments in employees' skills and knowledge therefore will strongly influence the private returns to R&D activity in terms of the organisation's competitive position and performance [18–20].

Beyond the organisational context, publicly funded R&D may play a vital role in the attraction and development of a region's human capital. For example, local organisations will benefit from the 'common pool' of skilled human capital which will gather around such centres (p. 319 in [21]). Labour market spillovers may emerge from these R&D centres and include the following: the availability of new or improved research skills developed through training; the provision of trained research staff as localised carriers of knowledge and the spillover of knowledge in the form of spin-outs or corporate entrepreneurship.

The implication of this is that the success with which private and social benefits are derived from publicly funded R&D centres of excellence depends on the way in which human resources are organised and managed to maximise their performance. In this context, the management and organisational structure of publicly funded R&D centres becomes as important as the political and economic infrastructure

which has enabled them [22]. In other words, public support for R&D centres may be directed towards R&D activity in the private sector, or in the public—university—sector.

Indeed, in recent years, the potential role of universities in contributing to economic growth has attracted increased attention [23]. This has coincided with changes in how universities perceive their contribution to economic development. Traditionally, investment in university research has occurred based on the expectation of a strong public good element, as it spills over to the private sector where it is exploited through innovation. In more recent years, however, universities have moved towards a model of ‘Academic Capitalism’ [24] characterised less by an open science approach to the dissemination of research and more by a growing emphasis on the protection of intellectual property through patenting, licensing and applied research [25].

Given the important impact of HRM on the private and social benefits arising from R&D activity in these centres, this warrants an examination of HRM practices in these two organisational contexts.

## 5.2 R&D in Private and Public Organisations

Distinctions between policy and practices in public and private sector organisations have been a central aspect of debates in public sector management [26], political science [27–29] and HRM [30–32]. A key objective has been to identify practices which, if transferred successfully to the other context, will lead to enhanced organisational performance. Perhaps the most notable example of attempts to identify and adopt the practices of the private sector in a public sector context is that of Managerialism and New Public Management (NPM).<sup>1</sup> Since the 1980s, the management theory of NPM has been the basis of attempts to modernise the public sector with key proposition of NPM being that greater orientation by the public sector towards the market will result in cost-efficiency for governments [34, 35].<sup>2</sup>

An important attempt to synthesise the literature on the distinctive characteristics of public and private sector organisations was undertaken by Boyne [37]. Drawing on a meta-analysis of 34 empirical studies published between 1960 and 1999, he identifies four areas of difference between private and public sector organisations: organisational environment, goals, structures and values.

Associated with these four key differences, he proposes that HRM policies and practices is one area where ‘the consequences of publicness’, as identified by Boyne [37], may have a significant impact. For example, in terms of the HR

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<sup>1</sup> For an overview of managerialism, new public management and more recently the term ‘leaderism’ see O’Reilly and Reed [33].

<sup>2</sup> More recently the underlying principles of NPM have been challenged with some [p. 467 in 36] suggesting that ‘this wave (of NPM) has now largely stalled or been reversed in some key ‘leading-edge’ countries’.

practices of recruitment, compensation, training and development and employee relations, Budhwar [38] and Budhwar and Boyne [39] argue that significant differences exist between public and private sector organisations. At the same time, and perhaps related to the emphasis on New Public Management from the 1980s onwards, Boyne et al. [31] suggest that the gap between public and private sector practices is narrowing. Harel and Tzafirir [40], despite identifying differences in recruitment practices and performance-related pay between private and public sector organisations, also suggest that there is a general movement towards ‘high-performance work practices’ in public sector organisations. Farnham and Horton [41], Lupton and Shaw [42] and O’Reilly and Reed [33] also point to a growing convergence between the management practices of large multi-divisional firms and public sector organisations. Doubts about the real extent of such convergence are emphasised by Duncan (p. 32 in [43]), however, suggesting that public sector convergence to private sector norms has been ‘more apparent than real’.

One context in which such public–private contrasts in HR policies and practices are evident is that of publicly funded R&D centres. Such centres exist in both the private and public sectors and are generally focused on ‘leading edge, industrially exploitable and commercially focused research’ with the aim of generating private benefits for the R&D performing organisation as well as wider social benefits, arising from ‘spillovers’ and (positive) externalities.<sup>3</sup> In this chapter, we are interested in how differences between the organisational contexts of publicly funded R&D centres based in the public and private sectors are reflected in their HR practices and any implications this may have for private and social outcomes.

Our opportunity to compare HR practices in private and public R&D centres arises from a policy experiment conducted in the UK region of Northern Ireland. In 2002, eighteen R&D Centres of Excellence (eight university-based centres and ten company-based centres) were established within a common public support framework with the objective of contributing to regional competitiveness.<sup>4</sup> Managed by Invest Northern Ireland—the regional development agency for Northern Ireland—the centres received total public funding of £34.7 m matched by investment by the host organisations of £79.7 m over three years.<sup>5</sup>

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<sup>3</sup> Private benefits accruing to the R&D Centre of Excellence from public sector support may include reducing the cost of building up knowledge stocks, enhancing business performance [44] and the ability of organisations to conduct future research projects [e.g. 45, 46]. Public support for R&D may also contribute to developments in human resources and innovation activity [e.g. 47] and improve firms’ ability to absorb R&D results or knowledge from elsewhere [48, 49]. In addition, reputational or ‘halo’ effects may also stem from receipt of public R&D support and create the potential for R&D cost savings through collaborative R&D and the sharing of research results.

<sup>4</sup> Specifically: ‘The RTD Centres of Excellence programme supports the establishment of R&D centres to stimulate leading edge, industrially exploitable and commercially focused research which will demonstrably improve the competitiveness of Northern Ireland industry’ [50].

<sup>5</sup> In fact, funding came from the European Union Programme for Peace and Reconciliation in Northern Ireland and the Border Region of Ireland (PEACE II) managed by the Special EU Programmes Body in partnership with the Northern Ireland Department of Employment and Learning.

The aim in this chapter is to contribute to our knowledge of differences in HR practices in different types of private and public sector technology-intensive environments. The context for this study allows us to overcome some of the limitations of previous research in this area by controlling not only for ownership between the private and public sector R&D centres but also the nature of the public funding the centres received, its duration, the region in which the centres were located and their common organisational focus, i.e. as R&D centres. The remainder of this chapter is structured as follows. In the next section, we consider the differences between private and public sector organisations and the potential consequences for HRM practices. Following that, we outline the background to the Centres of Excellence programme in Northern Ireland, the characteristics of the R&D centres supported and the data collection methods employed in our study. The main empirical findings of the research are outlined, and the final sections of the chapter then consider the key issues and potential implications arising from the research.

### **5.3 Organisational Context and HRM Practices**

In this section, the differences between R&D centres in private (business) and public sector (university) organisations are considered, and a series of propositions for HRM policies and practices are developed. The conceptual underpinning to the research reported in this chapter is derived from Boyne [37] who identifies public-private contrasts along four dimensions: organisational environment, goals, structures and values. He argues that public sector organisations often have a greater diversity of stakeholders than those in the private sector, potentially generating goal ambiguity [51]. Second, reflecting the varied interests of stakeholders, public sector organisations may need to be more open and responsive to a range of stakeholder needs, perhaps contributing to greater instability. Finally, Boyne [37] argues that the environment of public sector organisations may be characterised by less competitive pressure than that facing private sector organisations. Each of these four dimensions is considered separately in terms of how they might influence private and public R&D centres and the HRM implications of each.

#### ***5.3.1 Organisational Environment and HRM Practices***

Looking first at the organisational environment in private and public R&D centres, it could be anticipated that university-based R&D centres would face greater conflicting expectations of their cultural, social and economic contribution.

In contrast, for private sector R&D centres, shareholders represent the primary interest group with the more focussed goal of sustained competitiveness.<sup>6</sup>

In an R&D centre, the role of external connections and competitive pressure are particularly relevant. This reflects the changing environment for R&D and innovation, which is characterised by the complexity of scientific and technological development, uncertainty surrounding R&D, high costs of R&D projects and shortened innovation cycles [52]. This environmental context has led organisations to develop global strategies emphasising strategic alliances. According to Rothwell (p. 22 in [53]), innovation now involves ‘horizontal linkages such as collaborative pre-competitive research, joint R&D ventures and R&D-based strategic alliances, i.e. innovation is becoming more of a networking process’. Rothwell refers to this model of innovation as ‘systems integration and networking’, while Chesbrough [54] terms it ‘open innovation’, with external knowledge seen as important in reducing development time and reducing the risk and cost of development.<sup>7</sup>

From an HR perspective, collaborating with partners outside the organisation not only benefits the organisation in terms of reducing the cost and risk of R&D and increasing the speed of technology development, but also benefits the individuals involved. For example, Katz and Martin [52] found that high levels of collaboration had a positive influence on publication rates. Opportunities to engage in external collaborative arrangements may therefore act as a valuable learning experience in broadening employees’ knowledge and resulting in career development.

In a university environment, a more open culture should make it easier for R&D centres to engage in an ‘open innovation’ model. At the same time, it is possible that lower competitive pressures in public sector organisations, as highlighted by Boyne [37], may reduce the probability of engaging in inter-organisational collaboration. Where R&D is more applied, generic and further removed from exploitation in the market, as is the case with most university-based R&D, the shortening of product life cycles and subsequently pressure on speed of development will be less important in driving external collaboration. Again this is likely to reduce the potential for such centres to form external collaborative links. Given these conflicting positions, it is difficult to predict a priori the likelihood of university R&D centres engaging in external collaborative arrangements as compared to company R&D centres. This suggests two possible propositions:

**Proposition 1a** *University R&D Centres will engage in inter-organisational innovation to a greater extent than private R&D Centres.*

**Proposition 1b** *University R&D Centres will engage in inter-organisational innovation to a lesser extent than private R&D Centres.*

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<sup>6</sup> O’Reilly and Reed [33] suggest that the more recent emphasis on leadership associated with transformational and system-wide change in the public sector has overcome the inherent tensions of diverse stakeholders, bringing them together in a unified discourse.

<sup>7</sup> This approach stands in stark contrast to the ‘closed innovation’ model whereby organisations depend solely on in-house R&D with very limited inter-organisational knowledge sharing.

### 5.3.2 Organisational Goals and HRM Practices

Differences in the goals of public and private sector R&D centres are also likely to reflect the variety of stakeholder profiles. Greater diversity of stakeholders in public R&D centres may, for example place greater emphasis on equity and accountability [35, 55], while Boyne [37] suggests that the search for such collective goals may result in multiple, and often vague, goals. In contrast, in private sector R&D centres, the narrower range of stakeholders might result in greater clarity of purpose with clearly articulated targets linked to the firm's business objectives.

In R&D centres, the main activity is knowledge generation in terms of basic, applied or experimental research. As recognised by Pavitt (p. 13 in [56]), however, 'the outputs of basic research rarely possess intrinsic economic value. Instead, they are critically important inputs to other investment processes that yield further research findings, and sometimes yield innovations'. Reflecting this, policy initiatives in the UK have increasingly emphasised the role of universities in both generating knowledge and facilitating the exploitation of this, largely through closer industry links [57].

In terms of the differences in the organisational goals of public and private R&D centres, this suggests that for private R&D centres, their stakeholders' focus on profit and sustained competitiveness is likely to emphasise the exploitation of knowledge as one of the main outputs of R&D activity. In contrast, for university-based R&D centres, the diversity of stakeholders is likely to suggest more diffuse outputs encompassing both knowledge generation and knowledge exploitation. One implication is that these differences in organisational goals between public and private sector R&D centres mean that employees in university-based R&D centres would engage in a broader range of knowledge generation and exploitation activities than their counterparts in company-based centres. This suggests:

**Proposition 2** *Employees in University-based R&D centres will engage in a broader range of dissemination and commercialisation activities than those in company R&D centres.*

Dietz and Bozeman [58] suggest that the output from R&D centres, in terms of publications and patents, is positively influenced by the career diversity of staff (i.e. inter-sectoral changes throughout their career). Similarly, Zucker et al. [59] in their research on 'star scientists' found that academics with industrial links had higher patent rates and the organisation had a greater number of products both in terms of those in development and those launched in the market. Therefore, the expectation would be that the greater diversity of stakeholders in university R&D centres means that researchers are required to undertake a wider range of activities, i.e. the writing of academic publications and dissemination of these findings as well as activities associated with the commercialisation of research. Furthermore, this requirement will lead to the recruitment of staff with a more diverse career background than for researchers in company-based R&D centres. This suggests:

**Proposition 3** *University-based R&D employees will display a more diverse career background than researchers in company-based R&D centres.*

### 5.3.3 Organisational Structures and HRM Practices

In addition to organisations' environment and goals, Boyne [37] summarises three ways in which the internal structures of public and private sector organisations can vary with public sector organisations having greater bureaucracy, facing more 'red tape' and having lower managerial autonomy. Ultimately, as with the goals of the organisation, these internal characteristics are shaped by the diversity of demands from different stakeholders and the need for public sector accountability. This can create rigidity within public sector organisations and a tendency to be risk-averse. The 2003 Lambert Review in the UK highlighted these characteristics in universities, identifying the prevalence of a risk-averse, bureaucratic mentality in universities, with managers 'prone to take decisions to committees in order to cover their backs,' (p. 98 in [57]). In terms of HR practices, uncertainty regarding the sustainability of funding, lower managerial autonomy and risk aversion may result in a tendency for R&D employment contracts to be on a fixed-term basis. This leads us to the proposition:

**Proposition 4** *University-based R&D centres are more likely to employ researchers on fixed term contracts whereas company-based R&D centres will tend to use permanent contracts.*

Research on the implications of employee contracts on organisational performance suggests that despite benefits to the organisation from employing staff on fixed-term contracts, i.e. a reduction in fixed employee pay and benefit costs, negative externalities may arise through a reduction in motivation and loyalty, therefore constraining innovation and creativity within the firm [60].

A further way in which organisational structures may influence HR practices is in terms of the use of teamwork and in particular, cross-functional activities. For cross-functional activities to occur, a fluid organisational structure is required with the ability to transfer resources and knowledge across organisational areas. Where teamwork is implemented successfully, research suggests that this positively contributes to employee commitment and motivation [61], innovative performance [22], scientific output [62], new product development [63] and general R&D effectiveness [64]. Kochanski et al. [65] develop this point by stating that not only does working in cross-functional teams improve performance, but also it increases an organisation's ability to attract and retain skilled R&D human capital because R&D workers enjoy engaging creatively in cross-functional teams.

In university R&D centres, rigidities generated by greater bureaucracy, red tape and lower managerial autonomy may constrain cross-functional team working. In contrast, private sector organisations tend to have a more organic structure, with lower demarcation between functional areas. Therefore, it is possible to propose that:



**Proposition 5** *Cross-functional working and teamwork will be less common in university R&D centres.*

### 5.3.4 Organisational Values and HRM Practices

The final distinction identified by Boyne [37] between public and private sector organisations relates to managerial values. Boyne [37] characterises managers in the public sector as being less materialistic and driven by financial rewards than those in the private sector but as having a lower level of organisational commitment. Pratchett and Wingfield [66] describe a similar view suggesting that managers in the public sector display a ‘public service ethos’. Financial rewards may be assessed in two ways: first, standard and predetermined remuneration levels and second incentive schemes or performance-related pay. In general, incentive schemes are believed to be positively related to employee motivation and subsequently organisational performance and to be more common in the private sector [39, 40]. Indeed in the UK, while 44 % of UK private sector organisations use some form of performance-related pay, only 19 % of public sector organisations made performance-related pay arrangements [67].

Based on this result, it would be natural to assume that R&D employees in private R&D centres would be more likely to be rewarded with performance-related pay than their public sector counterparts. However, performance-related pay may be less significant as a motivator among R&D employees than among other groups. Jordan [68], for example found that US R&D workers seek employment in organisations with a clear research vision and that focus on future competencies and capabilities. Most of all, on top of competitive salaries, R&D workers are motivated by non-monetary incentives, ‘particularly recognition of the value of their work’ (p. 23 in [68]). Non-monetary rewards may come in the form of stimulating career opportunities, rewards for creative thinking and team-based work all of which will positively contribute to an organisation’s performance in R&D [65]. Therefore, while differences in managerial values between private and public sector R&D centres might suggest that financial incentives would be more common in the private sector, this may be less evident for R&D workers. Hence, it is possible to suggest that:

**Proposition 6** *R&D workers in private and university centres will not receive performance related pay.*

## 5.4 R&D Centres of Excellence Programme

The research which forms the basis for analysis in this chapter was undertaken in a UK region, Northern Ireland. In early 2000s, there were longstanding concerns about low levels of R&D and innovation in the region [69, 70]. One assessment at the time concluded that Northern Ireland’s regional innovation system was

'dominated by relatively few large firms, with predominantly national and global rather than local and regional linkages, and supported by relatively low levels of regional private and public R&D'. The result was that 'business innovation [was] too low in Northern Ireland and the linkages in the innovation system [were] inadequately developed. Both the level of innovation (capabilities) and of interaction in the innovation process (networks) need to be increased' (p. 74 in [71]).

With the regional Northern Ireland government aware of the evidence that increasing R&D and innovation can have positive effects on firm-level and economy-wide growth and productivity, the rationale and context for public intervention in the level of R&D investment was set. In 2002, the Centres of Excellence R&D programme was launched to 'support the establishment of R&D centres to 'stimulate leading edge, industrially exploitable and commercially focused research which will demonstrably improve the competitiveness of Northern Ireland industry' [50]. In other words, the programme of R&D support was established with the explicit objective of contributing to regional competitiveness.

The programme was launched with two open and competitive calls for proposals. From 28 applications for funding, direct financial support was offered to eighteen R&D centres (eight university-based centres and ten company-based centres). Public sector investment in these 18 centres amounted to £34.0 m (30.0 % of total costs) with this matched by an additional £79.4 m from the centre's host organisations over three years. The ten company-based R&D centres accounted for 40.3 % of total programme investment and were awarded 31.5 % of public funding. As a result, the eight university R&D centres accounted for the remaining 59.7 % of the total R&D investment and received 68.5 % of public funding. This difference in funding between the university and company centres reflects the fact that on average, the university centres were larger and public support was proportionately greater. One consequence of this open call for applications was that the sectoral composition of the centres was quite diverse with a focus on engineering and life science applications (Table 5.1).

Through a longitudinal monitoring approach, data were collected for all 18 centres over the 3 years period when they were receiving financial support (2003–2006). A mixed methods approach was adopted including periodic written reports and interviews with each of the centres focusing on a range of issues including HRM practices. The data therefore comprise three main elements. First, each of the R&D centres was asked to complete a detailed written questionnaire every four months between February 2004 and September 2006. This provided regular quantitative data on the level and type of R&D activity being conducted in each R&D centre, employment profile, employee characteristics, staff moves, etc. with an average response rate of 75 % throughout the period.

Second, more in-depth face-to-face interviews were conducted with each R&D centre on an ongoing basis to validate data obtained through the written returns and follow-up issues of particular interest. Third, in November 2005, a series of focussed semi-structured interviews were carried out with each of the centres relating specifically to their HRM policies and practices. At the time of these

**Table 5.1** Profile of R&D centres

PRC No.	Budget £m	Subject focus	Host organisation	Types of R&D		
				Major focus		Minor focus
				Basic R&D	Applied R&D	
1	1.52	Software process improvement	University	●	●	
2	0.95	Technology start-up and incubation	University		○	●
3	37.76	Electronic communication technologies	University	●	●	○
4	4.20	Medical polymers	University	○	●	○
5	3.95	Environmental monitoring technologies	University		●	●
6	4.00	Functional genomics	University		●	
7	3.65	Aeronautical technologies	University	○	●	○
8	11.65	Nanotechnology	University	○	●	○
9	2.71	Automotive engineering	Locally owned SME			●
10	4.71	Food research and development	Locally-owned firm			●
11	3.68	Electric power engineering	MNE operation		○	●
12	7.97	Recording media substrate	MNE operation		●	
13	4.99	Mobile software systems	MNE operation			●
14	4.50	Electrical engineering test centre	MNE operation		○	●
15	2.89	Scientific cameras	Locally-owned SME		○	●
16	3.14	Controlled drug delivery	MNE operation		○	●
17	7.03	Proteomics	Locally-owned firm		○	●
18	4.15	Speciality pharmaceuticals	Locally-owned SME			●

interviews, 416 people were employed by the centres [380 on a full-time equivalent basis (FTE)].<sup>8</sup> Therefore, the Centres of Excellence programme accounted for 8.7 % of R&D employment in Northern Ireland in 2005, in terms of FTEs [72]. Three hundred and nineteen of these posts were ‘new’ jobs created through the programme, of which researchers comprised 66.6 %, technical support were 26.9 % and other staff 6.5 %.

<sup>8</sup> Of these 416 employees, 343 were employed on a full-time basis, with 73 staff dividing their time between centre activities and other responsibilities in the wider organisation.

## 5.5 Empirical Results

The first proposition (1a, 1b) relates to the way in which inter-organisational innovation links might be shaped by the organisational environment within which R&D centres are operating. In general terms, however, little evidence was found of the anticipated differences in the extent of inter-organisational collaboration between public and private R&D centres. There is however more variation in the nature of these collaborative relationships. For example, where company-based R&D centres collaborated with external organisations, these tended to be locally based, industrial partners. For one of the ICT R&D centres, for example relationships with other software companies were important in managing fluctuations in the demand through contract labour:

We don't collaborate as such, but we do use both [company A] and [company B] as the source of contract labour. So one of the ways of managing our peaks in demands and the desire sometimes to have engineers on board which we could let go at short notice.

Other collaborative relationships were based on complementary technologies as a means of achieving product and service innovation:

We are to some extent collaborating with [company A], [company B] and [Company C] at the moment. ... our technology is non competing and so we are willing to collaborate in terms of trying to close a deal with a customer. [Company B] is trying to get us to sign an agreement to distribute or resell their technology, which we might do.

In other situations, collaborative relationships were formed as a means of identifying and implementing best practice:

One of the projects that we did was the [product], a brand new vehicle and there was a whole host of new partners involved in that project... We did a partnership agreement with [company A] and selected them as a benchmarking partner for the development of our new vehicles. A lot of the people involved in that project went to Coventry and looked at how they did the styling of the new vehicle; how they did the detail design of the new vehicle; how they did the prototyping; and their design processes. During the project they came to us at various strategic points along the project and helped us with the design process and the timing plans.

Employees in the university-based R&D centres were much less likely to engage in collaboration with local industrial partners. Interestingly, however, efforts were being made by a majority of university-based centres to ensure that local industry had an 'input' into the research process. For example, in some of the centres, an advisory committee had been formed with industrial representation from both local and international industry partners. What was found however was that university R&D centres' innovation links tended to be globally oriented, with the benefits from these links emphasised in terms of dissemination of research activity and findings, access to technology and intellectual expertise, as well as a role in setting industry standards. This is reflected in the following quotes from University centres:

Our collaborations have been more with English universities and American and Indian and hopefully very shortly Japanese universities, more than local universities. That has been part of the whole outreach agenda.

We operate at an international level. I [the director of the Centre] am one of the members of an international research consortium... developing a research roadmap which will influence the strategy for all research Centres... The consortium has about thirty members. It is a mixture of academics and industry representatives. There are seven large corporations funding this consortium... What these organisations get out of it is an insight into what is emerging in terms of research in software process. This is promoting the Centre, the university and Northern Ireland in a good light because it is in an international forum. That is one area of the research where there has been an impact. We wouldn't otherwise have been involved in this. We wouldn't even have been invited to be involved in this if we hadn't had the Centre and been engaged in the type of activities that we are doing.

Collaboration between university-based R&D centres and local industrial partners was less common with one of the company-based centres commenting that:

So far we have failed to find any way to engage with R&D within [NI Universities]. They seem to have as much money as they can spend to do the things that interest them. My attempts to suggest projects that we might in some way support have had literally no interest.

In summary, there is little clear support for either Proposition 1a or 1b, but instead differences are observed in the nature of the external linkages of public and private R&D centres. In general, company R&D centres tended to collaborate locally with other private sector companies. For the university R&D centres, inter-organisational relationships tended instead to be international and people-driven. Links between the university R&D centres and local industry were limited and where these were found they tended to be in an advisory capacity as opposed to engaging in collaborative R&D.

The second proposition suggested that employees in university-based R&D centres would engage in a broader range of knowledge generation and exploitation activities than employees in company-based centres. Overall strong support is found for this proposition in terms of the number of technical presentations, research papers, patent applications, patents granted and the number of licenses that staff in the university-based and company-based R&D centres developed during the study period.

Controlling for the total number of employees and researchers in the R&D centres, each researcher in the company R&D centres undertook an average of 0.5 presentations and wrote 0.03 research papers during the study period compared to 2.5 presentations per university R&D researcher and 9.1 research papers (Table 5.2). This reflects the greater emphasis on knowledge sharing in the universities and the much lower propensity for companies to share information. As one company centre remarked:

The nature of our business is that we would typically patent or publish something that cannot be reverse engineered, externally. Hence what we would do is provide a patent

**Table 5.2** Dissemination, protection and commercialisation of research by R&D centre employees

R&D centre type	Technical presentations per employee	Research papers (submitted or published) per employee	Patent applications per employee	Patents granted per employee	Number of licenses per employee
<i>Private—</i>					
Per employee	0.32	0.02	0.07	0.00	0.01
Per researcher	0.51	0.03	0.11	0.00	0.01
<i>University—</i>					
Per employee	1.95	7.25	0.13	0.02	0.02
Per researcher	2.45	9.10	0.16	0.02	0.02

*Source* Monitoring returns and RTD centres of excellence programme

protection or if we felt it was technically of benefit to the wider industry we would sometimes go along to a conference. However, everything within this Centre can be reverse engineered. Hence publishing or communicating externally creates a disadvantage to us as an operations facility so we keep it quiet. So our people are one of our best kept secrets.

The contrast between the company and university R&D centres is less stark in terms of their activities to protect intellectual property. University R&D employees were slightly more likely to make patent applications (0.16 compared to 1.11 per employee in company R&D centres), and while the data suggest that university researchers were also more successful with these applications within the study period, it is likely that insufficient time had elapsed to fully determine the conversion of patent applications into awards. In general, researchers in both university and company R&D centres were engaged in a similar number of license agreements (Table 5.2).

Overall, support is found for the second proposition that university R&D employees engage in a wider range of dissemination activities than employees in company R&D centres: employees in company R&D centres focus on knowledge protection and commercialisation activities, and those in university R&D centres devote considerable effort to dissemination but also seek to protect and commercialise their research.

Proposition 3 asserted that R&D staff in university R&D centres were likely to have more diverse career histories than those in company centres. To investigate this, information was collected on the career history of all new employees in the R&D centres (Table 5.3). Of the 319 new employees, 6.3 % were graduates who came straight from university with no previous employment, with this percentage being similar for both company- and university-based centres.<sup>9</sup> Of the other 210 new staff employed by the company-based R&D centres, no employees had come directly from academic positions but all had instead previously been employed in

<sup>9</sup> The employment history of 17.7 % was unknown. It should also be noted that only the most recent employment prior to working in the Centre of Excellence was considered.

**Table 5.3** Previous employment of new employees in university- and company-based R&D centres

Centre type	New staff (n)	Previous employment (% of employees)					
		In host organisation	NI private sector	NI public sector	Outside NI	No previous employment	Unknown
Private	209.6	46.3	17.7	0.5	4.8	5.7	25.1
University	109.75	43.5	20.0	3.6	21.9	7.3	3.6
Total	319.35	45.3	18.5	1.6	10.6	6.3	17.7

*Source* Monitoring returns and RTD centres of excellence programme

industry. This was noted by a number of companies as adding significantly in terms of skills:

We have a lot of ex-[multinational 1] staff in fact if you look around you will probably find fifty to sixty per cent of people here are ex-[multinational 1]. Virtually all of the management team, myself included, spent many years in [multinational 1]. Then there is some [Multinational 2] in the mix now, a little bit of [multinational 3]. These are all people with comes, data protocol, networking service management backgrounds.

By contrast, around 20 % of new recruits to the university-based centres had previously been employed in the private sector. As two of the university centres commented:

Most of them [new recruits] have had some history of industry employment in their careers, but are now academics. I would view that as a net strength because people getting out there and working in industry for a while and then coming back gives a breadth of experience to academia. We have got a balanced suite of skills and experience.

One thing that is maybe a little bit unique about [R&D Centre] is the engineers. There are engineers, senior engineers and principal engineers... They have industrial experience, so they are a key part of what we are trying to do here...Of the engineers seventy-five per cent [fifteen engineers] would be from industry.

Another aspect of individuals' career histories which was markedly different between the company and university R&D centres was the proportion of new staff that were recruited locally or internationally (Table 5.3). Less than 5 % of employees in the company R&D centres were recruited from outside the region compared to over a quarter of new employees in the university centres. The company-based centres perceived recruitment of employees from outside the region as a problem stating that 'it is pretty tough to bring people in from far away'. In contrast, industrial engineers recruited to the university-based centres tended not to be local and were typically mobile highly skilled workers:

The last five or so [engineers] to have been recruited have all been Chinese. That is where we are finding a lot of very skilled, capable and knowledgeable people. Typically they won't have come directly from China they have come from GB, maybe working in universities there and have come over from GB to here.

These findings therefore support our third proposition that employees in university R&D centres will have more diverse career backgrounds than researchers in company R&D centres. Furthermore, the findings support that of Dietz and Bozeman [58] that greater career diversity will be reflected in a broader spectrum of research-related activities by employees.

The fourth proposition related to contrasts between employment contracts in the company and university R&D centres. Drawing on Boyne's [37] synthesis of the literature, it could be expected that greater rigidity and risk aversion in public sector organisations would mean that fixed-term employee contracts would be more common than in company R&D centres. In fact, approximately three-quarters (76.3 %) of all staff in the R&D centres were employed on permanent contracts; however, this was concentrated among the company centres—97.9 %—compared to 42.9 % in the university centres. University centres highlighted that they were reluctant to employ new staff on a permanent contract when ongoing funding was not guaranteed. As one centre manager commented:

At the moment it [the contract term] is for the funding period on account that the university is strangely unwilling to take me at my word when I assure them that we will be coming into maturity in year four.

As centres approached the end of their public funding period, the university centres were also conscious of the imminent need to downsize the scale of their activities. Of full-time equivalent jobs in the centres over the 3 years funding period, approximately 57.8 % of these were being sustained in the post-funding era (Table 5.4). Continuity of employment was however much more likely in the company centres (77 % of employees) than the university centres (23 %), therefore emphasising that the type of contracts issued to employees directly reflected the likelihood of continuation (or termination) of employment in the post-funding period.

These results provide strong support for the fourth proposition that university centres would tend to be more risk-averse and that this would be reflected in the nature of employment contracts. If staff were employed on a project-specific initiative with a dedicated funding stream, universities were most likely to recruit in line with the period of funding. By contrast, company centres tended to recruit staff on permanent contracts.

The fifth proposition relates to the greater likelihood that company centres are engaging in team working. In fact, the vast majority of centres (75.0 %) operate

**Table 5.4** Composition of jobs sustained beyond public sector funding period in the R&D centres

Centre type	Jobs sustained	Research	Technical	Admin	Other staff
Private	175 (77 %)	78.3	17.1	4.0	0.6
University	53 (23 %)	67.9	15.1	17.0	0.0
Total	228 (57.8 %)	75.9	16.7	7.0	0.4

*Source* Monitoring returns and RTD centres of excellence programme



cross-functional teams, with this only slightly more common in the company centres (77.8 %) than in the university centres (71.4 %). This suggests little support for the fifth proposition that the rigidities associated with increased bureaucracy and red tape in public sector organisations were constraining cross-functional working and teamwork. Instead, both university and company R&D centres identified individual and collective benefits from team working, for example:

The way we are structured we actually have seven people who are common throughout all of the projects. So what we have is a core of seven people and they are involved in all of the projects. Then each of the projects has its own project team as well. By keeping the central core each project is aware of what is going on in every other project.

The final proposition related to the impact of organisational values on HR practices particularly in terms of their impact on performance-related pay. In terms of average salaries, little difference is found between the company (£26,700) and university centres (£25,720). However, three-quarters (77.7 %) of company centres operated additional financial incentive schemes compared to none of the university centres. In all of the company R&D centres where financial incentives were used, these applied across the organisation and were not confined to R&D employees. Similar organisation-wide rules also applied in the universities, suggesting that such rules seem to be more important in setting remuneration profiles in the R&D centres than the specific nature of individuals' occupation. According to Adams' equity theory [73, 74] R&D staff will perceive an inequity if other staff receive performance pay and they do not (and vice versa). This perceived unfairness will lead to a readjustment of their efforts to a level which they feel is justified by the differential rewards. Therefore, if an organisation is using performance pay as an incentive for non-R&D employees, it needs to be an organisation-wide policy, which explains why the organisational context rather than individual occupation is a key determinant of remuneration schemes.

## 5.6 Conclusions

Based on this comparison of the HR practices of a group of closely related university and company R&D centres, relatively strong support is found for each of the dimensions of public-private contrast identified by Boyne [37]. In particular, the contrasting organisational environments of the university and company centres, marked by very different profiles and aspirations of stakeholder groups, lead to very different patterns of external connectivity and patterns of engagement by centre staff in external knowledge-sharing activities.

Reflecting the aspirations of their more diverse stakeholder groups, university R&D centres are more engaged with international partners than with local industrial partners, and their staff are significantly more strongly engaged in knowledge-sharing activities than those in the private sector centres. Conversely, driven largely by the issues of confidentiality and concern over knowledge leakage, staff in

company-based R&D centres were only minimally engaged in external knowledge sharing but had developed some local linkages with supply chain partners. The wider range of knowledge-sharing activities in the university centres was also facilitated by the more diverse prior career histories of staff newly recruited to the centres.

Organisational structures—hierarchy, regulation and a lack of managerial autonomy—also prove important in shaping employees' contractual position in the R&D centres. Greater risk aversion in the university centres led to more use of fixed-term employment contracts and less ability to sustain research activity beyond the end of the public funding period. No difference was evident, however, in the flexibility of working practices within the university- and company-based centres with, for example both equally likely to be working in cross-functional teams. Finally, Boyne [37] argues that organisational values may be important in shaping differences in remuneration structures between public and private sector organisations. Here, while little difference is found between the salaries of university and company R&D centre employees, there was evidence that performance-related pay was used significantly more by the company centres (see also [67]).

The results suggests that at least in the context of R&D centres, significant differences still exist between the HRM practices of public and private sector organisations, even where these are located in the same region, face similar economic and social conditions, and are being funded through the same public funding programme. In conceptual terms, this casts some doubt on the 'convergence' hypothesis between public sector and private sector HRM practices. Instead, this study finds each type of organisation maintaining its distinctive HRM approach as a consequence of, and influence on, its organisational role and performance. For example, the greater risk aversion of the university centres is reflected in the greater use of fixed-term employment contacts for research staff, something almost unheard of in the private sector R&D centres. This has implications for whether research activity is sustained beyond the end of the public funding period. Conversely, the more 'open' attitude to knowledge sharing by the university centres—facilitated by employees' more diverse career histories—generates more external contacts although these tend to be extra-regional rather than local.

The distinctiveness of the HRM approaches of university and company R&D centres which are observed—reflecting more fundamental differences in their organisational structures goals and values—impacts significantly on their patterns of external connectivity and their potential contribution to regional economic development. From a policy standpoint, this raises interesting questions about the relative benefits of providing public support to university and company R&D centres, a dilemma considered in the next section.

## 5.7 Implications

In this chapter, drawing on the framework for public–private contrasts developed by Boyne [37], the research reported here has emphasised the continued differences between HR practices in the public and private sectors. The organising framework developed by Boyne [37], with its focus on organisational environment, goals, structures and values, proved useful here to capture the effects of the diversity of R&D centres’ stakeholders and their organisational context on HR practices. Even among the R&D centres considered here, with their very similar social and economic positioning and funding source, significant differences in HR practices were evident in terms of each aspect highlighted by Boyne [37]. Notably, however, the study focused on a group of relatively new public and private sector organisations, albeit ones that had grown relatively rapidly as a result of public sector funding. As such, it might be anticipated that these R&D centres would start up with legacy values, structures, etc. derived from their host organisations, before developing more individual organisational cultures. This development process might either reinforce existing cultural norms etc. or reflect the process of convergence identified by Farnham and Horton [41] and Lupton and Shaw [42], etc.

Analysing this developmental process, which may reflect both secular trends towards public–private sector convergence as well as increasing organisational maturity, is likely to require some development of the essentially static Boyne [37] framework to integrate processes of organisational learning. This is likely to involve notions of absorptive capacity [e.g. 75], as the R&D centre seeks to identify and implement leading practice from elsewhere, as well as the balance between external and internal pressures or resistance to change. In empirical terms, analysing this process of development and maturity will require a more long-term longitudinal approach covering more than the three years of the current study.

The study also suggests a number of implications for public policy and investment priorities reflecting the continuing differences in HR practices between the university and company centres. First, while it is clear that public support for R&D centres, both public and private, can contribute to a strengthening of regional R&D, the regional benefits which derive from each centre do differ with implications for investment priorities. Company R&D centres, for example, are more likely to form local supply chain research linkages with other firms, but engage in little other knowledge-sharing activity. University R&D centres, on the other hand, tend to have stronger international linkages and weaker local networks but do tend to be more actively engaged in knowledge sharing and dissemination. From a policy standpoint, this suggests a range of options and priorities with different potential benefits. If the policy priority is strengthening local supply chains, then supporting company R&D centres may be most appropriate. If, on the other hand, the aim is to develop a region’s external connectivity and knowledge gathering capability, then supporting university centres may be more relevant.

Other factors may also be relevant here, however, such as the sustainability of R&D activity following any period of public funding. In our study, at least, the

university centres, in particular, were making much greater use of fixed-term contracts and seemed less able to sustain R&D activity after a period of public funding than the company R&D centres. On the negative side, this is likely to limit the long-term impact of public investments in university R&D centres. The limited life of such centres may, however, have other spin-off benefits if, for example, staff attracted initially by the centre join other organisations in the region. In the centres considered here, for example, around three-quarters of leavers remained within Northern Ireland over the monitoring period.

Finally, given the emphasis in Boyne [37] on the impact of the diversity of stakeholder goals on public organisations in particular, it is worth considering the potential distortionary effects of public R&D funding. For example, the need to address local economic agendas may distort existing research agendas by contributing to the diversity of stakeholders within each R&D centre. Alternatively, the need to satisfy the criteria for public funding may be distorting the operating policies and practices of both the university and company centres. The research findings suggest a reassuring picture here, however. While there is some evidence that public support for the university R&D centres is broadening the scope of these centres, prompting HR practices such as IP protection and commercialisation, we see little evidence of any other changes in organisational priorities as a result of the Centres of Excellence programme funding. In part, this may reflect the ‘light touch’ design of the programme itself, however, which operated by asking potential centres to compete for funding in an open competition with relatively few required performance criteria. This allowed centres to develop their own agendas and ways of working with relatively few administrative restrictions.

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